

3/30/16

HW: Review sheet

Test 3 on Friday

Quarter Test Fri 4/8

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$$17a) \int_0^3 x \, dx$$

$$= \left. \frac{x^2}{2} \right|_0^3$$

"Find the antiderivative of x and then plug in 3, plug in 0 and subtract."

$$= \left(\frac{3^2}{2} \right) - \left(\frac{0^2}{2} \right)$$

$$= \frac{9}{2} - 0 = \frac{9}{2}$$

$$18a) \int_0^2 \left(1 - \frac{1}{2}x \right) dx$$

$$|x^0|$$

$$\frac{|x^1|}{1} = x$$

$$= \left. x - \frac{1}{2} \cdot \frac{x^2}{2} \right|_0^2$$

$$= \left. x - \frac{x^2}{4} \right|_0^2$$

$$= \left(2 - \frac{2^2}{4} \right) - \left(0 - \frac{0^2}{4} \right)$$

$$= 1 - 0 = 1$$

$$19a) \int_0^5 2x \, dx$$

$$2 \quad 2x + c$$

$$= 2x \Big|_0^5$$

$$= (2(5)) - (2(0))$$

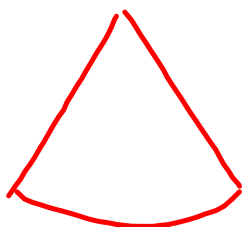
$$= 10 - 0$$

$$= 10$$

$$\int_a^b f(x) dx = F(b) - F(a)$$

Review Sheet:

1)



$$r = 2h$$

$$d = 40$$

$$r = 20$$

$$h = 10$$

$$\frac{dV}{dt} = 5$$

Find: $\frac{dh}{dt}$

Cone

$$V = \frac{1}{3} \pi r^2 h$$

$$V = \frac{1}{3} \pi (2h)^2 h$$

$$V = \frac{1}{3} \pi 4h^2 h$$

$$V = \frac{1}{3} \pi 4h^3$$

Derivative

$$\frac{dV}{dt} = \frac{4}{3} \pi 3h^2 \frac{dh}{dt}$$

$$\frac{dV}{dt} = 4\pi h^2 \frac{dh}{dt}$$

$$\frac{5}{400\pi} = \frac{dh}{dt}$$

$$5 = 4\pi (10)^2 \frac{dh}{dt}$$

$$5 = 400\pi \frac{dh}{dt}$$

$$\frac{1}{80\pi} \text{ m/sec} = \frac{dh}{dt}$$

$$2) \int (-2x^{-3} + 20x^{-5}) dx$$

Find
the
Anti-derivative

$$= \cancel{-2} \frac{x^{-2}}{\cancel{-2}} + \cancel{20} \frac{x^{-4}}{\cancel{-4}} + C$$

$$= x^{-2} - 5x^{-4} + C$$

$$= \left(\frac{1}{x^2} - \frac{5}{x^4} + C \right)$$

$$3) \int \left(\frac{\cancel{-14} x^{5/2}}{\cancel{2}} \right) dx = \int (-7x^{5/2}) dx$$

$$= -7 \frac{x^{7/2}}{7/2} + C = \frac{2}{\cancel{7}} \left(\cancel{-7} x^{7/2} \right) + C$$

$$= -2x^{7/2} + C$$

$$= \boxed{-2\sqrt{x^7} + C}$$

$$\begin{aligned}
 4) \int \left(\frac{-5 \sqrt[3]{x^2}}{3} \right) dx &= \int \left(\frac{-5}{3} x^{2/3} \right) dx \\
 &= \cancel{\frac{-5}{3}} \cdot \frac{x^{5/3}}{5/3} + C \\
 &= -x^{5/3} + C
 \end{aligned}$$

$$\begin{aligned}
 5) \int_{-1}^3 (-x^3 + 3x^2 + 1) dx \\
 &= \left[-\frac{x^4}{4} + \frac{3x^3}{3} + 1x + C \right]_{-1}^3 \\
 &= \left[-\frac{1}{4}x^4 + x^3 + x + \cancel{C} \right]_{-1}^3 \\
 &= \left(-\frac{1}{4}(3)^4 + (3)^3 + 3 + \cancel{C} \right) - \left(-\frac{1}{4}(1)^4 + (1)^3 + 1 + \cancel{C} \right) \\
 &= \left(-\frac{81}{4} + 30 \right) - \left(-\frac{1}{4} - 2 \right) \\
 &= \frac{39}{4} - -\frac{9}{4} \\
 &= \frac{48}{4} = 12
 \end{aligned}$$

$$\begin{aligned}
 6) \int_{-3}^0 (4 \sqrt[3]{x}) dx &= \int_{-3}^0 (4 x^{1/3}) dx \\
 &= \left[4 \cdot \frac{x^{4/3}}{4/3} \right]_{-3}^0 \\
 &= \left[3 x^{4/3} \right]_{-3}^0 \\
 &= (3(0)^{4/3}) - (3(-3)^{4/3}) \quad (-3)^{4/3} \\
 &= 0 - (-3(3\sqrt[3]{3})) \quad \frac{\sqrt[3]{81}}{3\sqrt[3]{3}} \\
 &= 9\sqrt[3]{3} \approx 12.980
 \end{aligned}$$

$$7) \frac{dy}{dx} = \frac{6x^2 - 2x^3}{x} \quad y(1) = 4$$

$$f'(x) = \frac{6x^2 - 2x^3}{x} \quad f(1) = 4$$

$$f'(x) = \frac{6x^2}{x} - \frac{2x^3}{x}$$

$$f'(x) = 6x - 2x^2$$

$$f(x) = \frac{6x^2}{2} - \frac{2x^3}{3} + C$$

$$f(x) = 3x^2 - \frac{2}{3}x^3 + C$$

use
f(1)=4

$$4 = 3(1)^2 - \frac{2}{3}(1)^3 + C$$

$$4 = 3 - \frac{2}{3} + C$$

$$4 = \frac{7}{3} + C$$

$$-\frac{7}{3} \quad -\frac{7}{3}$$

$$\frac{5}{3} = C$$

$$f(x) = 3x^2 - \frac{2}{3}x^3 + \frac{5}{3}$$

$$y = 3x^2 - \frac{2}{3}x^3 + \frac{5}{3}$$

$$8) f'(x) = 3x^2 - 8x + 1$$

$$f(1) = 4$$

$$f(x) = 3\frac{x^3}{3} - 8\frac{x^2}{2} + x + c$$

$$f(x) = x^3 - 4x^2 + x + c$$

$$4 = 1^3 - 4(1)^2 + 1 + c$$

$$4 = 1 - 4 + 1 + c$$

$$6 = c$$

$$f(x) = x^3 - 4x^2 + x + 6$$

$$9) f''(x) = 6x^2 - 12x + 2$$

$$f'(x) = \frac{6x^3}{3} - \frac{12x^2}{2} + 2x + c$$

$$f'(x) = 2x^3 - 6x^2 + 2x + c$$

use
 $f'(1) = -3$

$$-3 = 2(1)^3 - 6(1)^2 + 2(1) + c$$

$$-3 = 2 - 6 + 2 + c$$

$$-1 = c$$

$$f'(x) = 2x^3 - 6x^2 + 2x - 1$$

$$f(x) = \frac{2x^4}{4} - \frac{6x^3}{3} + \frac{2x^2}{2} - 1x + c$$

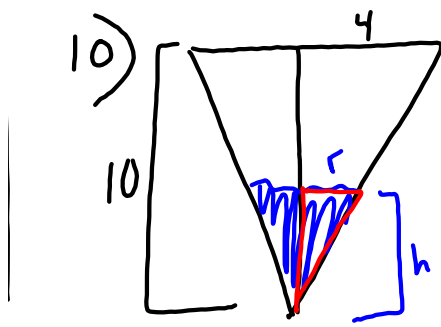
$$f(x) = \frac{1}{2}x^4 - 2x^3 + x^2 - x + c$$

use
 $f(-2) = 1$

$$1 = \frac{1}{2}(-2)^4 - 2(-2)^3 + (-2)^2 - (-2) + c$$

$$1 = 8 + 16 + 4 + 2 + c$$
$$-29 = c$$

$$f(x) = \frac{1}{2}x^4 - 2x^3 + x^2 - x - 29$$



Given $\frac{dV}{dt} = 2$ $h = 5$

Find: $\frac{dh}{dt}$

$$\frac{4}{10} = \frac{r}{h}$$

$$\frac{2h}{5} = r$$

$$V = \frac{1}{3} \pi r^2 h$$

$$V = \frac{1}{3} \pi \left(\frac{2h}{5}\right)^2 \cdot h$$

$$V = \frac{1}{3} \pi \frac{4h^2}{25} \cdot h$$

$$V = \frac{\pi}{3} \cdot \frac{4h^3}{25}$$

$$V = \frac{4\pi}{75} \cdot h^3 \rightarrow \frac{dV}{dt} = \frac{4\pi}{75} \cdot 3h^2 \frac{dh}{dt}$$

$$2 = \frac{4\pi}{75} 3(5)^2 \frac{dh}{dt}$$

$$\frac{dh}{dt} = \frac{1}{2\pi} \text{ ft/min}$$

$$2 = \frac{4\pi}{\cancel{75}} \cdot \cancel{75} \frac{dh}{dt}$$

$$2 = 4\pi \cdot \frac{dh}{dt}$$

$$\frac{2}{4\pi} = \frac{dh}{dt}$$